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pbar/p Ratio @ 200 GeV from p+p and Au+Au Collisions

- Physics of baryons in heavy-ion collisions

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pbar/p – Analysis @200 GeV

Au + Au

- P02gc, P02gd production, FullField + ReversedFullField
- $|z_{\text{Vertex}}| < 25 \text{ cm} \rightarrow 890k$ events
- $n_{\text{Hits}} \geq 23$
- 9 centrality bins {510,431,312,217,146,94,56,30,14}
- proton/anti-proton ID by dE/dx
- proton momentum energy loss corrected
- anti-proton absorption corrected

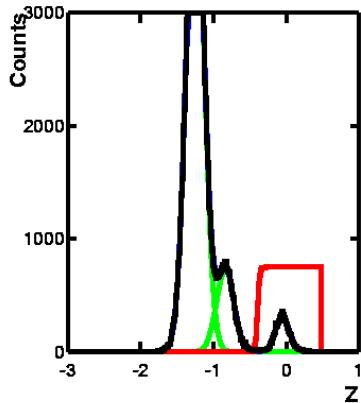
p+p

- P02ge production, FullField + ReversedFullField, 2M events
 - ≥ 4 tracks in TPC
-

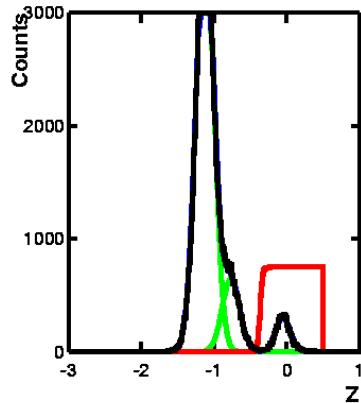


dE/dx PID

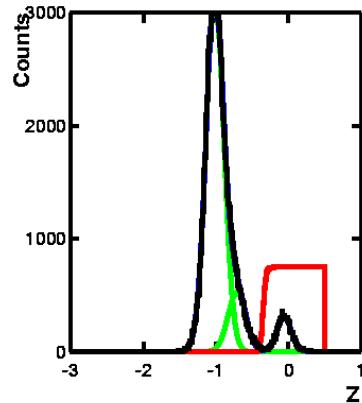
$550 < p_t < 600 \text{ MeV}/c$, cent 9, $0.0 < |y| < 0.1$, pos.



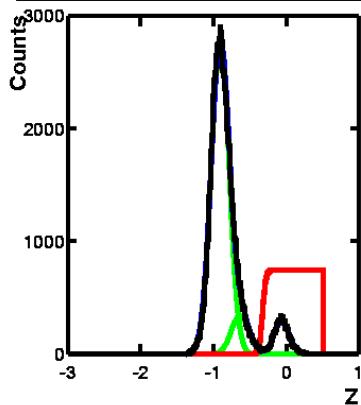
$600 < p_t < 650 \text{ MeV}/c$, cent 9, $0.0 < |y| < 0.1$, pos.



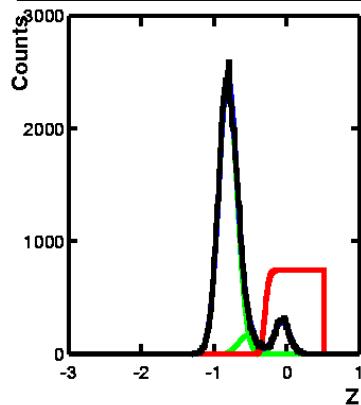
$650 < p_t < 700 \text{ MeV}/c$, cent 9, $0.0 < |y| < 0.1$, pos.



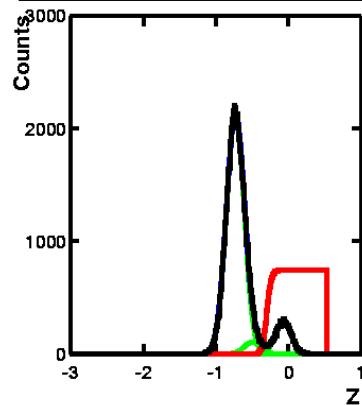
$700 < p_t < 750 \text{ MeV}/c$, cent 9, $0.0 < |y| < 0.1$, pos.



$750 < p_t < 800 \text{ MeV}/c$, cent 9, $0.0 < |y| < 0.1$, pos.



$800 < p_t < 850 \text{ MeV}/c$, cent 9, $0.0 < |y| < 0.1$, pos.



Au + Au @200GeV

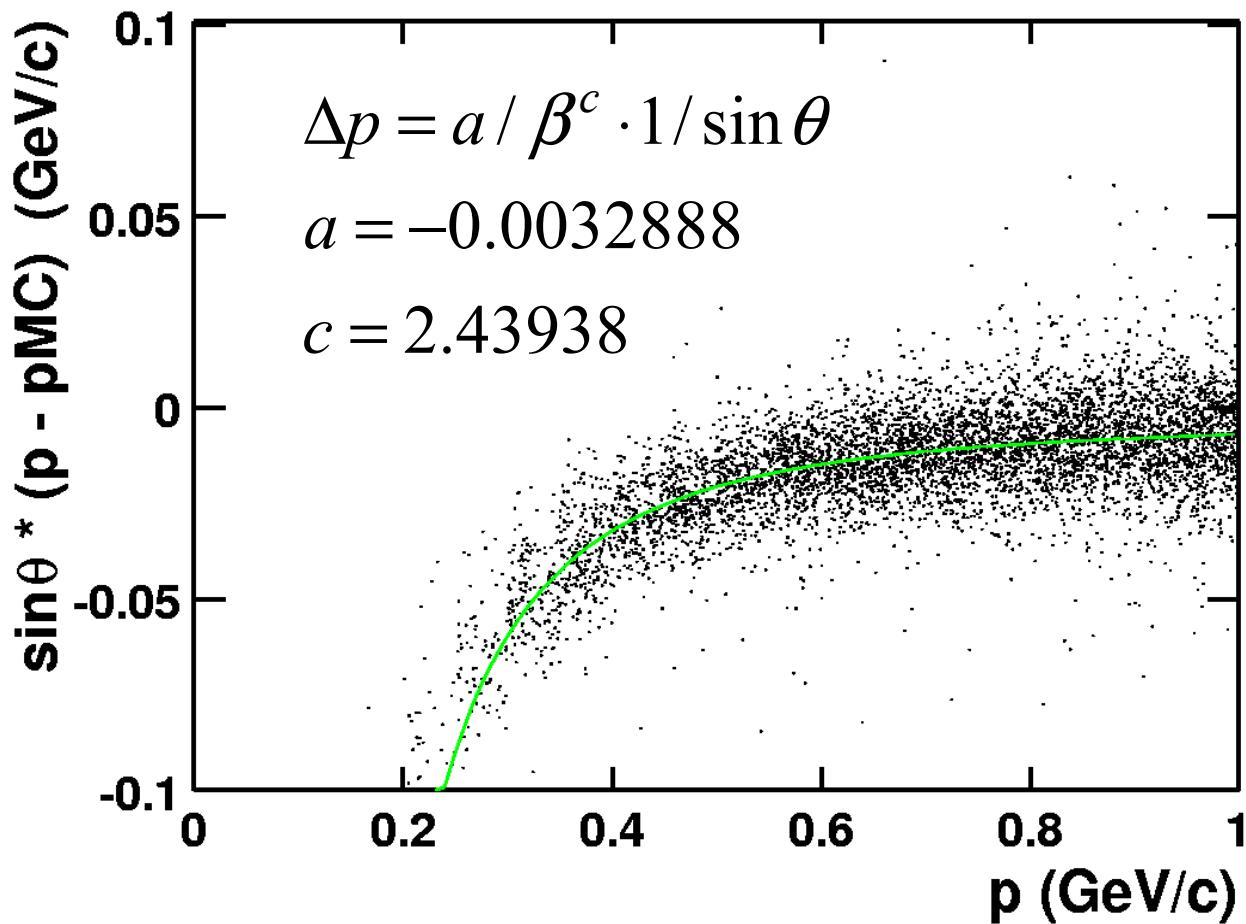
5% most central

$|y| < 0.1$

$p_t = 550 - 850 \text{ MeV}/c$



Energy Loss Correction



Global tracks!

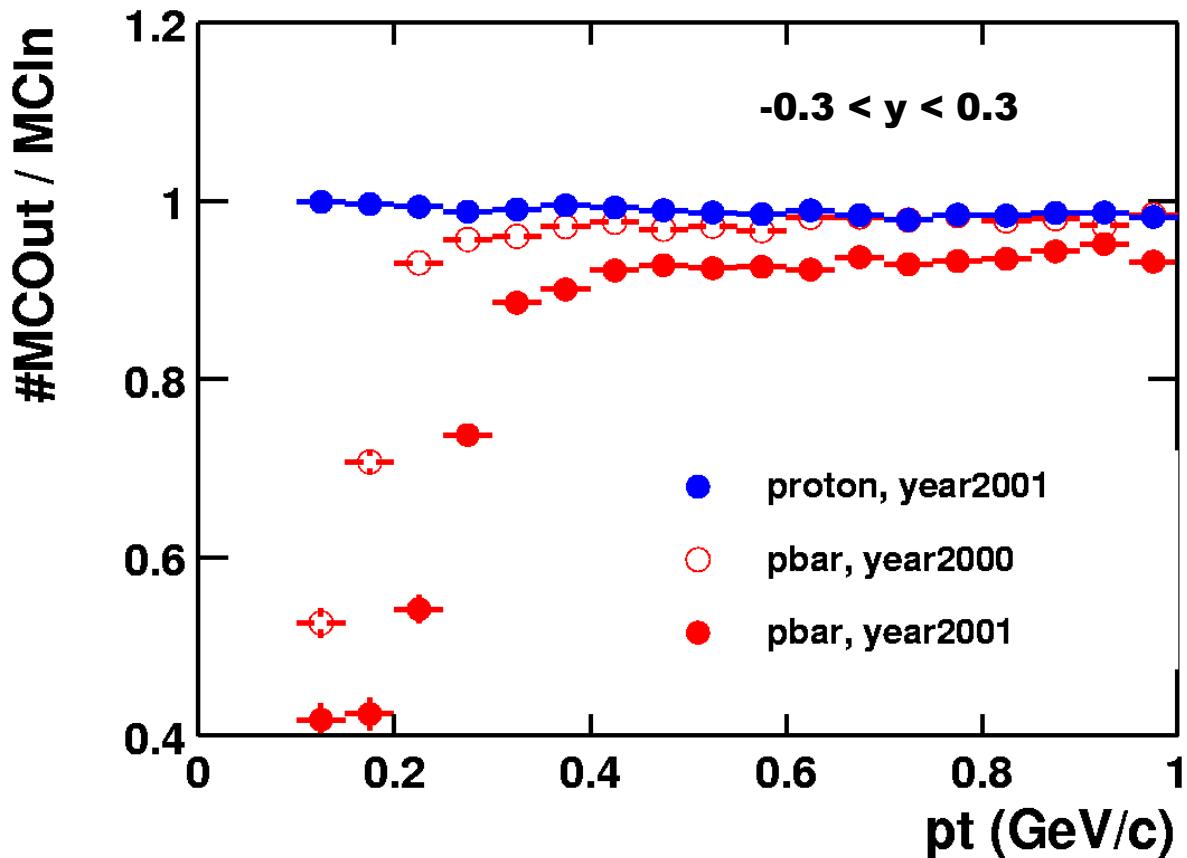
year2001

β :relativistic velocity

θ :angle between
beam axis and
particle trajectory



Anti-proton Absorption

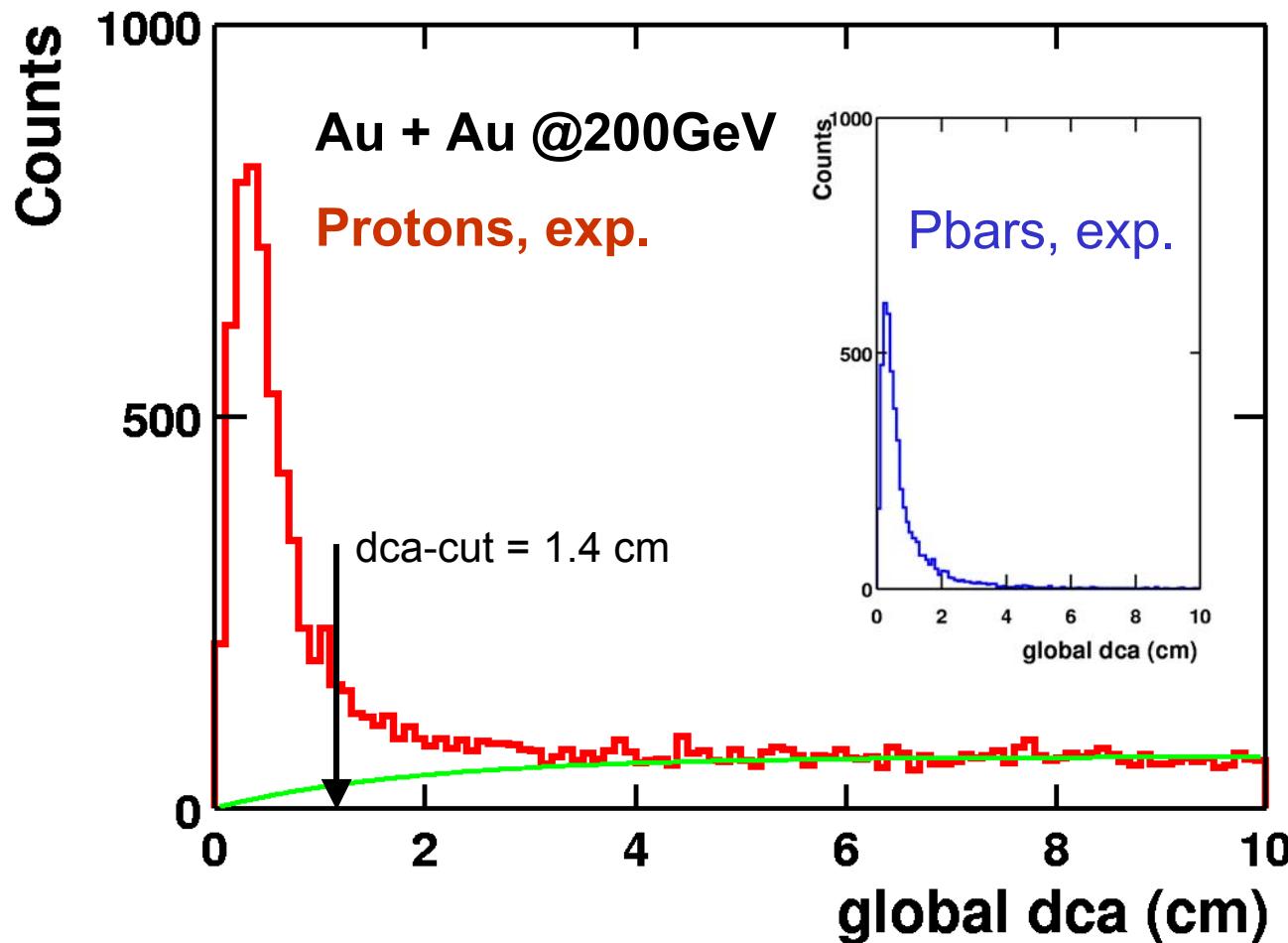


absorption at
 $0.45 < pt < 0.65 \text{ GeV}/c:$

- 1) Pbar2000: 0.970
- 2) Pbar2001: 0.925
- 3) Proton2001: 0.990



Background Subtraction

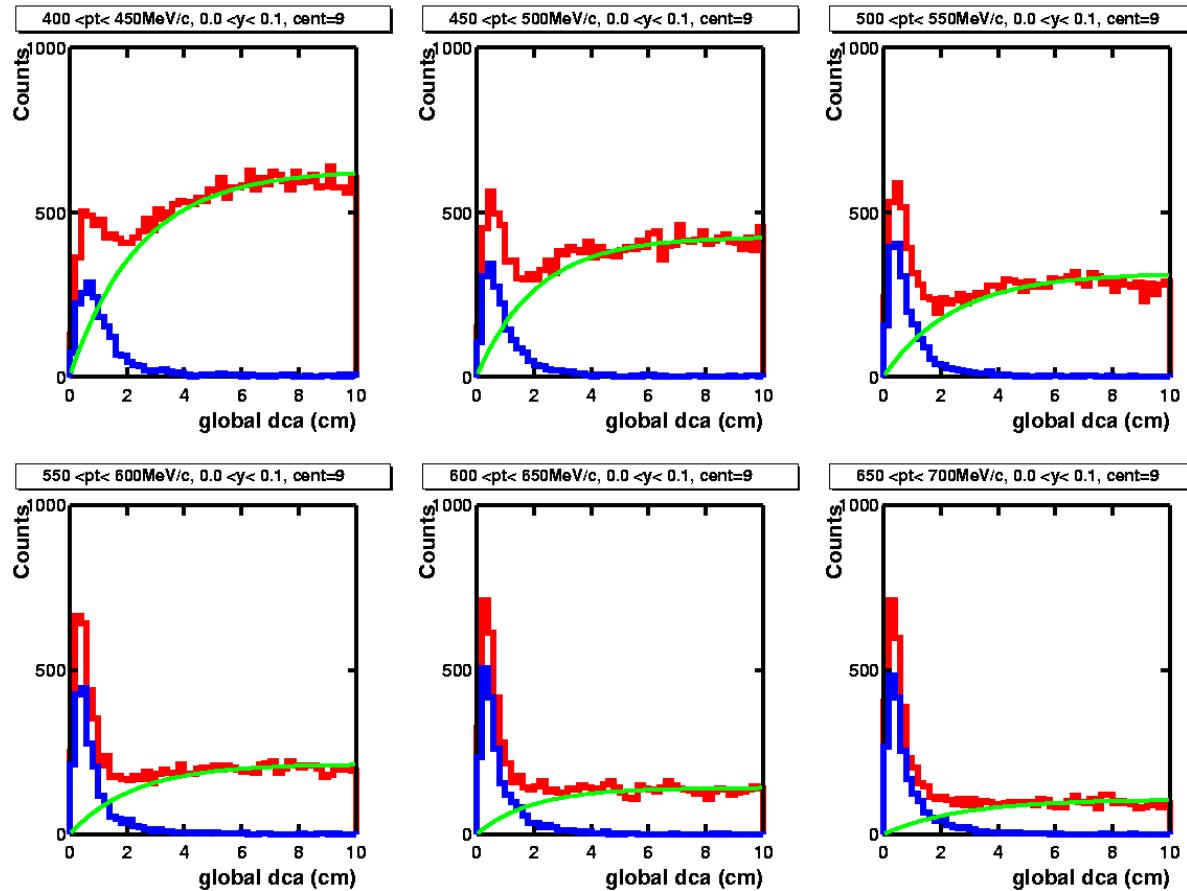


- Assume proton, dca = pbar, dca + background $\rightarrow \chi^2 / \text{ndf} = 1.6$
- dca < 1.4 cm minimizes background
- background shape consistent with MC data

$$f(x) = A(1 - \exp(-x / \kappa))$$



Proton Dca-Distributions, Au+Au

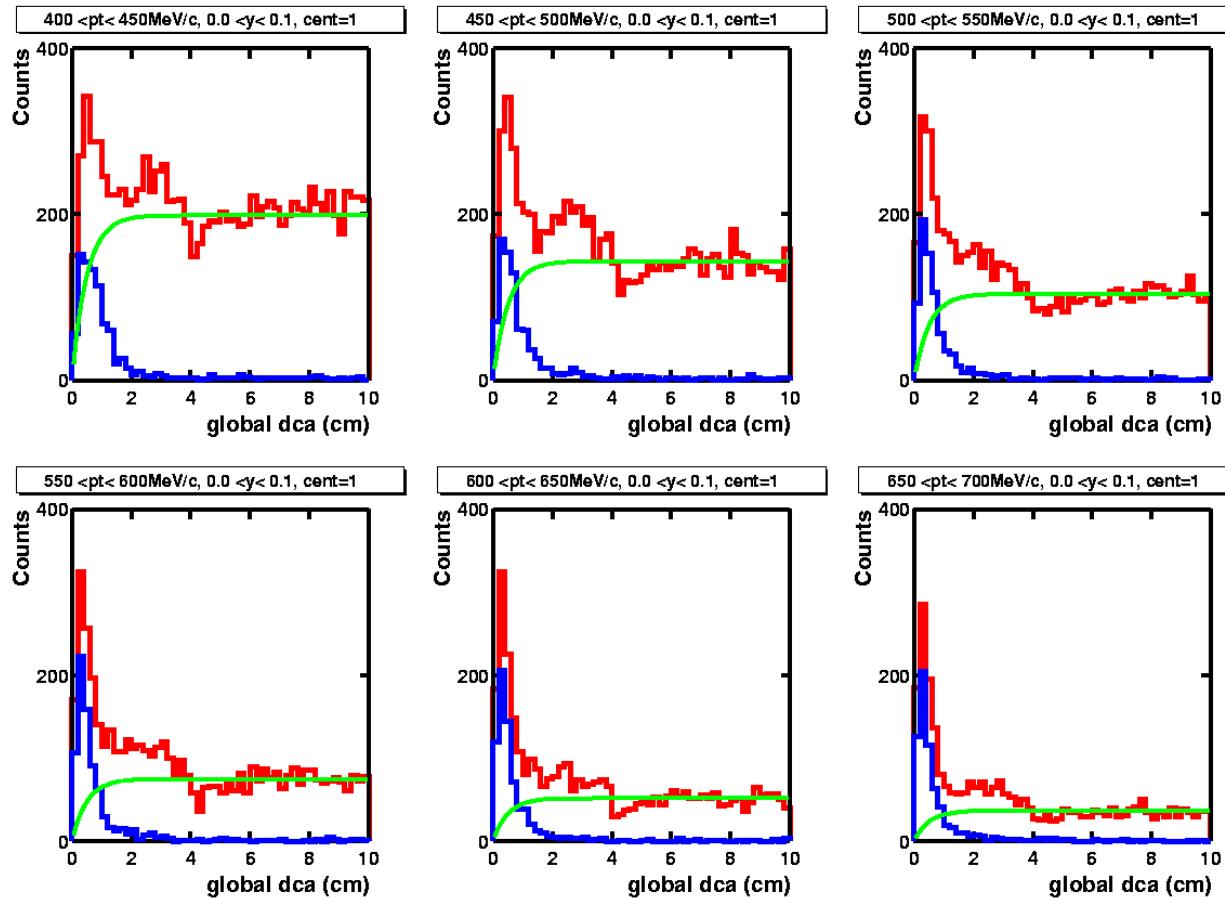


- Au + Au @200GeV
- 5% most central
- $|y| < 0.1$
- $p_t = 400 - 700 \text{ MeV}/c$

p
 $p\bar{p}$
background



Proton Dca-Distributions, p+p

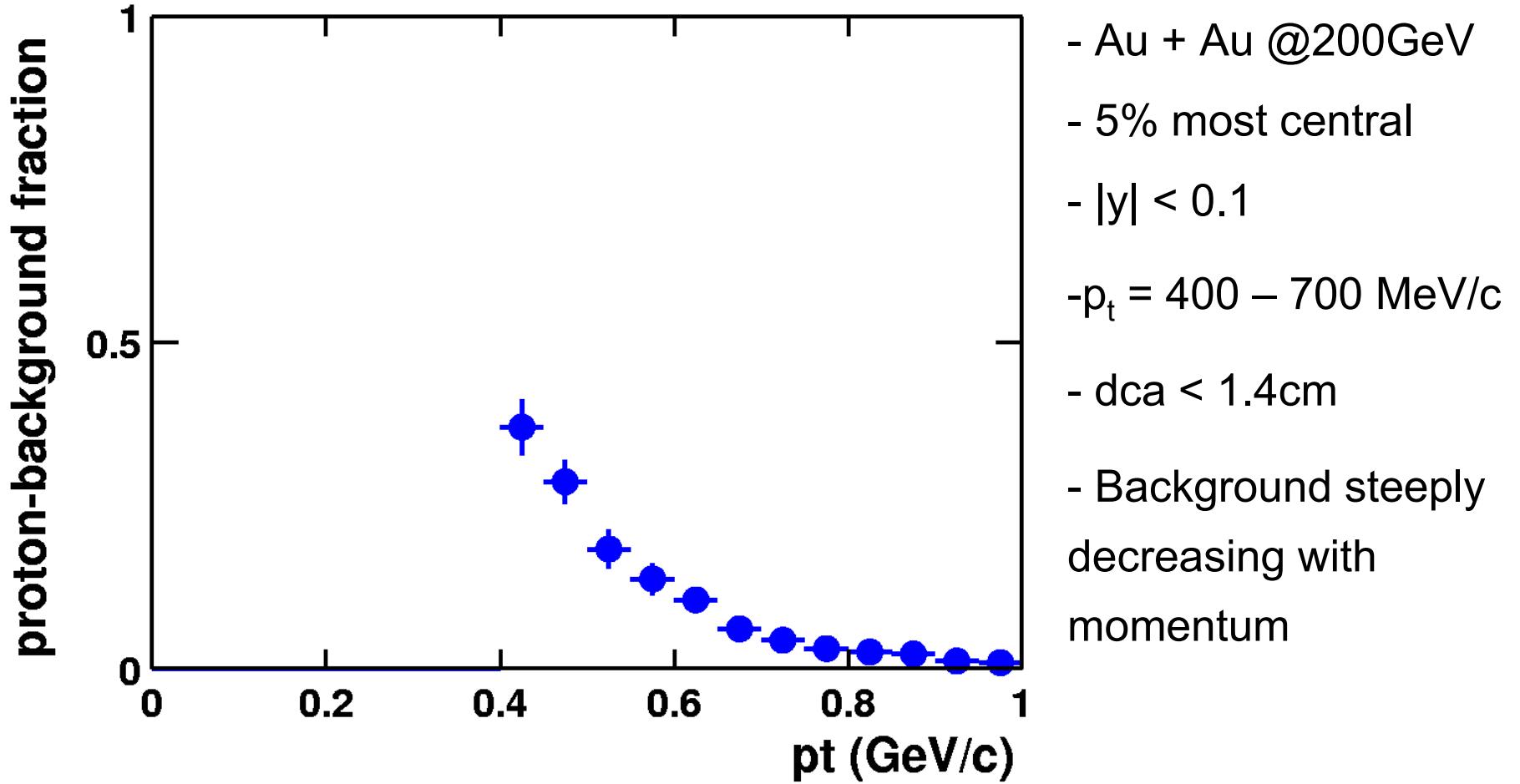


- p+p @200GeV
- $|y| < 0.1$
- $p_t = 400 - 700 \text{ MeV}/c$
- ‘bump’ at 2-4cm not understood yet

p
pbar
background

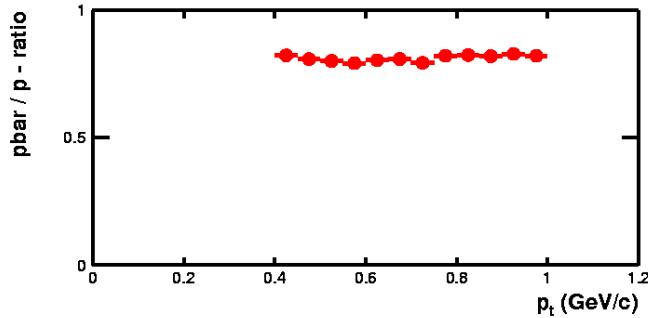


Background Contribution

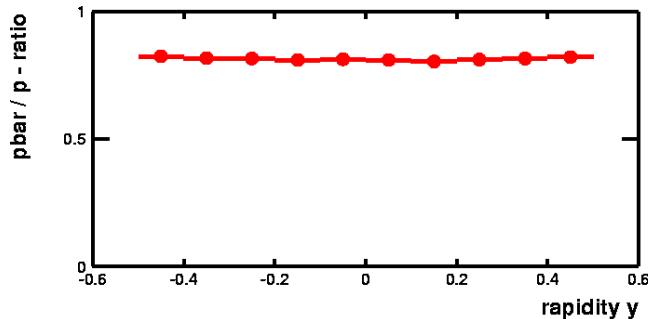




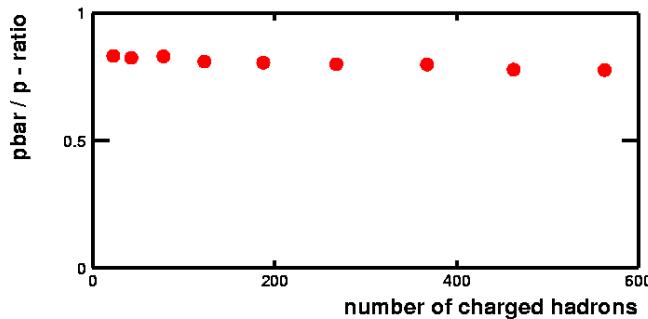
Pbar/p-Ratio @200GeV



- vs p_t , minbias, $y = 0.0 - 0.3$
 $pbar/p = 0.81 \pm 0.002(\text{stat.})$



- vs y , minbias, $p_t = 0.6 - 0.8$
 $pbar/p = 0.81 \pm 0.002(\text{stat.})$



- vs $n\text{Charge}$, $|y| = 0.0 - 0.3$, $p_t = 0.6 - 0.8$
 $pbar/p = 0.78 \pm 0.005(\text{stat.})$ for
5% most central



Systematic Errors

$|y| < 0.3$, $pt = 0.6 - 0.8 \text{ GeV}/c$, all centrality bins

NFitPts: $23 \rightarrow 28$: < 0.005

Background: $< 0.03 + 0.0x$

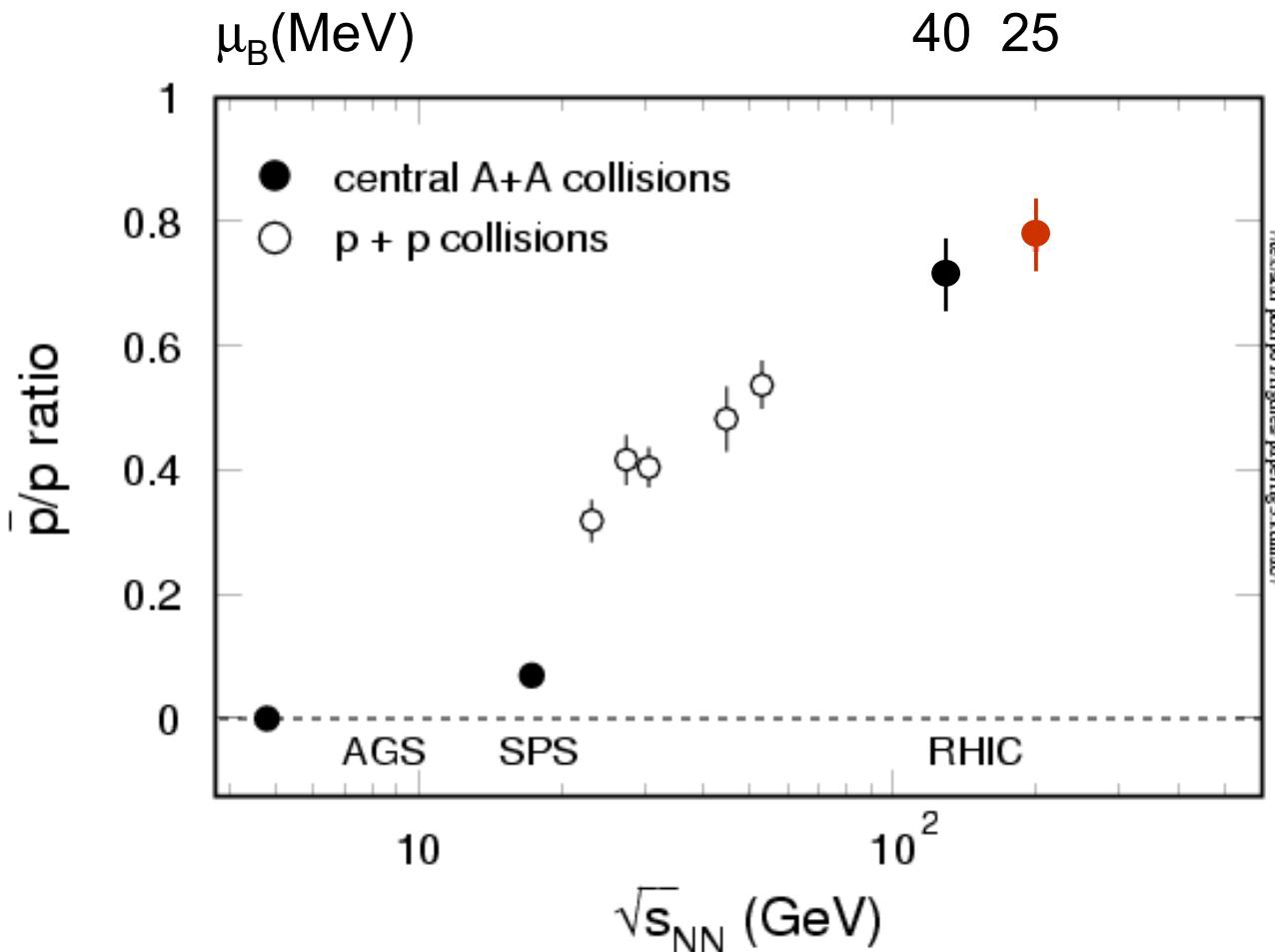
$10 < |vtz| < 25\text{cm}$ < 0.005

$\eta^* \text{ vtz} > 0$ < 0.010

dca 1,2cm to be done



Energy Scan



- Not net-baryon free at RHIC!
- pbar/p pair-production is dominant



Conclusion/Outlook

- pbar/p-ratio = 0.81 ± 0.02 (stat.) Au + Au @ 200GeV
 - no strong pt, y dependence
 - slightly decreasing with centrality
 - understand proton-background in p+p
 - more systematic studies: dca-cut, 1.0, 2.0cm

pbar/p ratio vs run no.

 - finalize analysis